

Cryptosporidiosis: Prevention Methods in Dairy Cattle

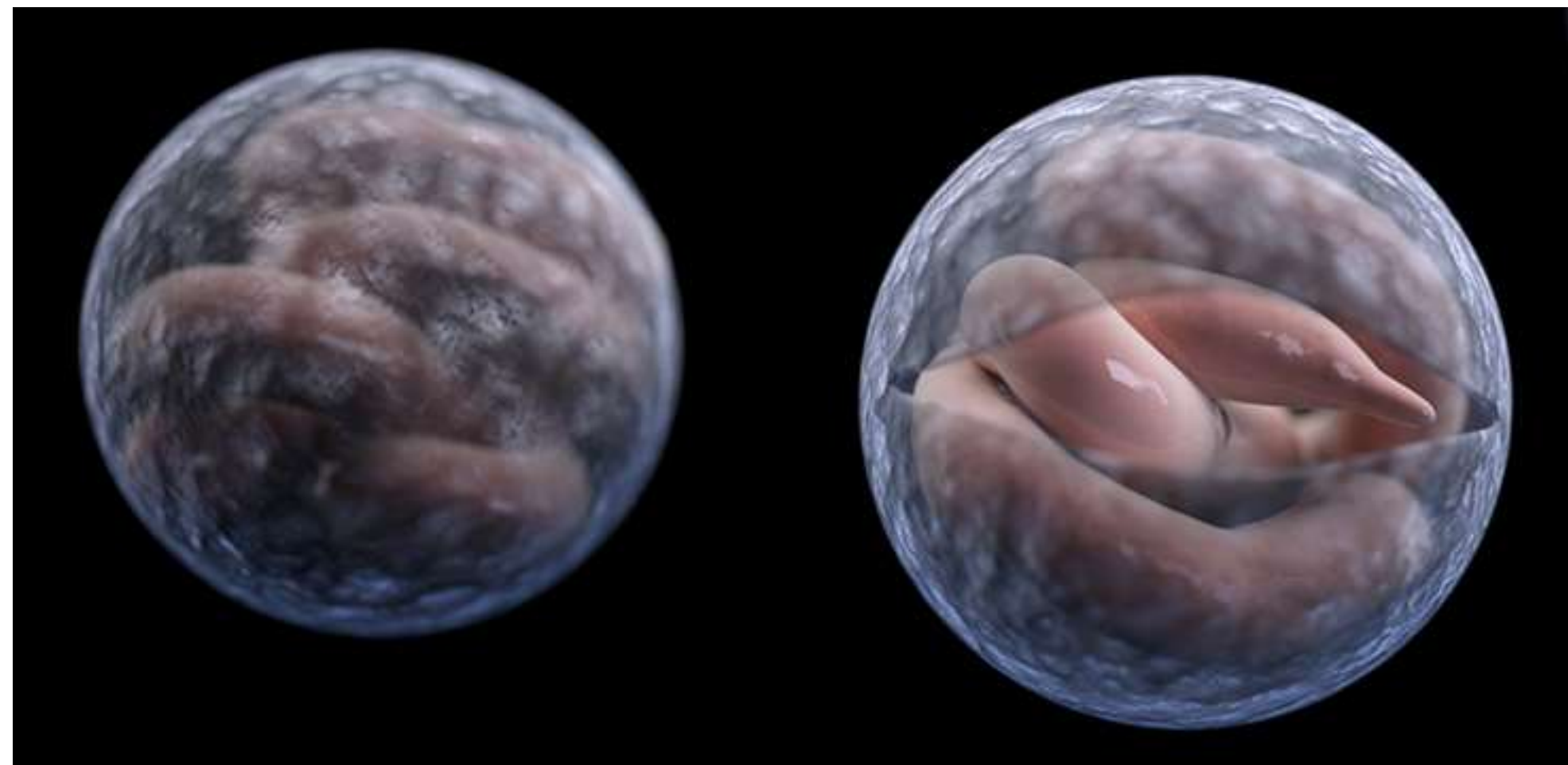
Haley Schwarz

School of Animal Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

Background

Cryptosporidiosis is a zoonotic disease which has major economical impacts on the Dairy Industry. Symptoms include severe diarrhea, stomach cramps, dehydration, fever, vomiting and nausea. Cryptosporidiosis is caused by a parasite called *Cryptosporidium*. Currently, there is no treatment for this disease other than management of the symptoms through rehydration therapy and diarrhea treatment. The reason *Cryptosporidium* has such an impact on the dairy industry is because it is an extremely effective parasite due to its ability to exist in the environment for months and its resistance to most disinfectants. Cryptosporidiosis is also a huge problem in developing countries. Applying what can be learned from research with animals to humans in developing countries can benefit them.

From May 2021-September 2022, I worked as an undergraduate research assistant on Cryptosporidiosis research in dairy calves. This research was aimed at testing different experimental compounds and how effective they were in managing cryptosporidiosis symptoms.



Picture 1: This picture features a realistic animation of *Cryptosporidium* oocysts. <https://www.cdc.gov/parasites/crypto/index.html>

Objectives

Objectives included:

- Expanding my knowledge on dairy calves and how to take care of them
- Working with the team to complete different tasks efficiently and effectively
- Gain experience working in a laboratory setting
- Learning how to prevent cryptosporidiosis transmission
- Completing a literature review on current research available about cryptosporidiosis
- Spreading my newfound knowledge about cryptosporidiosis prevention

Roles and Duties

Duties I had as an undergraduate research assistant:

- Feeding milk replacer to calves
- Nipple bucket training calves
- Daily health checks
- Collecting fecal and blood samples
- Assisting with processing calves
- Dosing with *Cryptosporidium* oocysts
- General cleaning
- Data collection
- Laboratory work
- Attending regular research group meetings
- Participate in trips to Mountain View Dairy to "birth" a new cohort of calves



Picture 2: This picture depicts the type of nipple bucket that was used to feed the calves milk replacer. https://www.valleyvet.com/ct_detail.html?pgguid=203bfde3-c550-4195-9693-308561fd6c77

The Experience

My experience involved working 10-15 hours a week as an undergraduate research assistant. This research was focused on testing different compounds and their effectiveness in treating Cryptosporidiosis symptoms. For this experience I would work one of two shifts: a feeding shift or a benchwork shift. Feeding shifts were at 6am and 6pm. During a feeding shift, calves are fed milk replacer and absorbed. Fecal samples are collected, and each calf's chart is filled out. Benchwork shifts included going to the laboratory and completing QuickCheks, qPCR splits, and placing samples in the oven to test dry matter. After completing benchwork, data that was collected in the laboratory notebook was then transferred into an excel sheet. Another part of this experience included traveling to Mountain View Dairy in Chatham, VA to collect calves for the cohort. We would travel to this farm to collect calves because of its large size. On farm trips, we would pull out calves into a sterilized wheelbarrow, process them, feed them colostrum replacer and place them in the trailer. Farm trips would happen every 10 weeks because we can only house eight calves at a time, and they only stay for 6-7 weeks. The second part of my capstone project included creating a literature review of current research and future research of Cryptosporidiosis and then creating a suggestions document for the VT Dairy Farm on how to prevent transmission.



Picture 3: This picture shows the parlor at Mountain View Dairy.

Suggestions for VT Dairy Farm

Part of my capstone project was creating a list of suggestions for the VT Dairy Farm about how to prevent transmission of cryptosporidiosis to have healthier calves. Suggestions were:

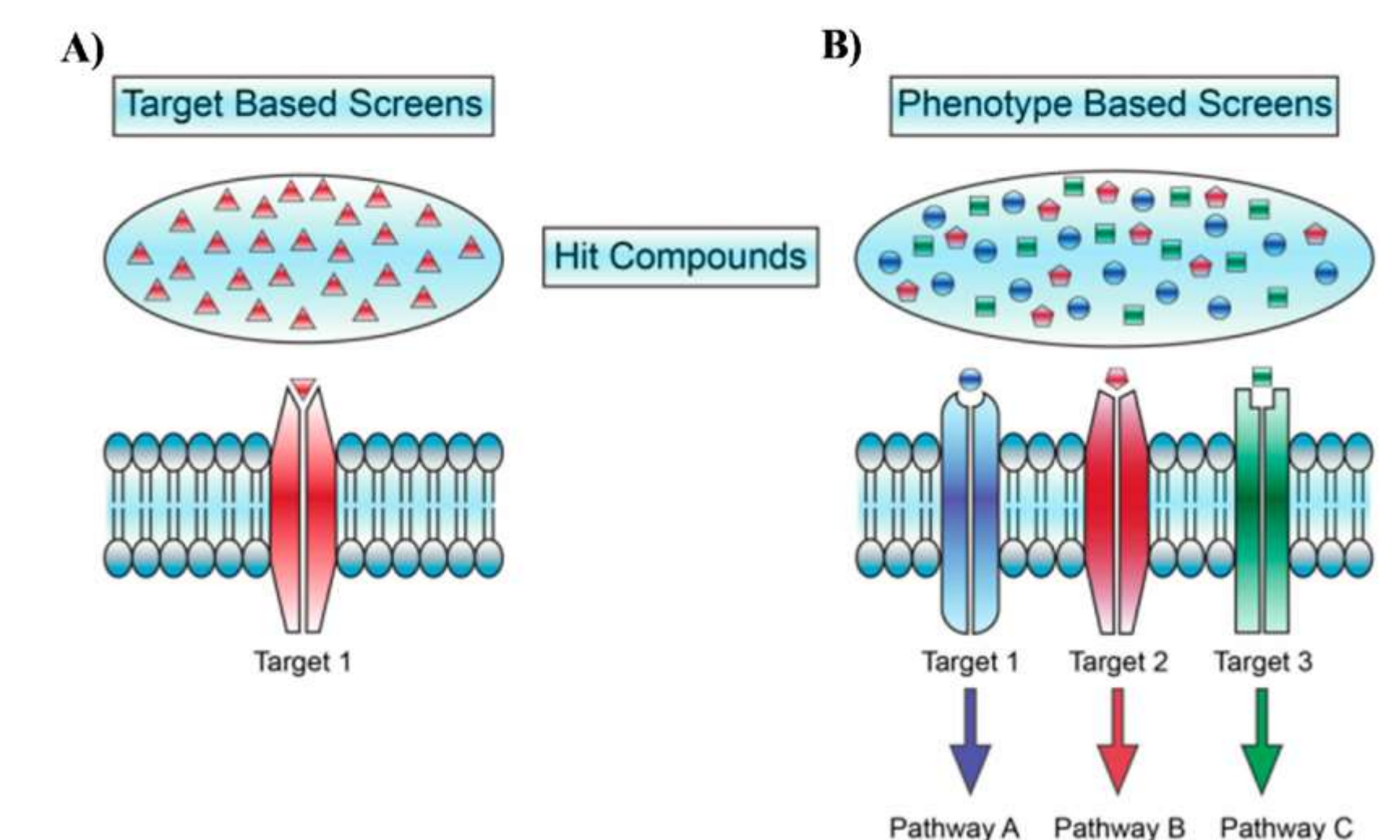
- Begin disinfecting with hydrogen peroxide instead of bleach and chlorine dioxide. Cryptosporidium is highly resistant to most cleaners; it has been proven that hydrogen peroxide is the best cleaner to kill the oocysts.
- Better management of calves moving through the wean pens. Cryptosporidiosis can be prevented through strict management of age groups of calves. Currently, Kentland Farm does not have an efficient system for monitoring ages of calves and when they should move pens. A better organization system such as a printable spreadsheet of dates when calves need to be moved could be implemented.
- More regular cleaning and disinfection of wean pens will help prevent the spread and will destroy oocysts. A regular cleaning and disinfection schedule can be made to ensure different areas of the calf barn are being cleaned. Currently, there is not an effective way to track when things are spread.
- To prevent spread of Cryptosporidium to staff at Kentland Farm, gloves when handling calves diagnosed with cryptosporidiosis should be required. As well as proper handwashing and change of clothes between calves to prevent spread.



Picture 4: This picture depicts the VT Dairy Farm from an aerial view. <https://www.t-l.com/project/virginia-tech-dairy-barn-relocation/>

Literature Review

The final part of my capstone project experience was writing a literature review and becoming a "local expert" on *Cryptosporidium*. I researched various scientific journal articles and the current treatments available for cryptosporidiosis. There are currently multiple research projects testing different compounds and transmission ways. There has been success with different compounds minimizing the effect on the symptoms in calves. Potential candidates of effective compounds include Calcium dependent-protein kinases, Methionyl-tRNA synthetase, Phenylalanyl-tRNA synthetase, Lysyl-tRNA synthetase. Immense progress has been made in treatment research through using phenotypic drug screening and targeted approaches. Even though a lot of progress has been made, there's still further research to be completed regarding cryptosporidiosis.



Picture 5: This picture shows both target-based drug screening and phenotypic based drug screening. <https://www.mdpi.com/1660-3397/17/6/340/html>

Conclusion

In conclusion, advancements in knowledge about Cryptosporidiosis and how to treat it are continually being made. Recent developments in research and drug discovery have led to significant escalations in knowledge but further research regarding host parasite interactions and transmission prevention is still needed.

Working as an undergraduate research assistant over the last year has been an extremely significant experience in my life. I found a passion for dairy cattle, learned how to work in a laboratory, learned more about diseases and the behind the scenes of how research projects work. When I first began this job, I had never worked in a professional research laboratory before and was slightly hesitant due to my lack of experience. After over a year of working in this research, my confidence in the laboratory and working with dairy calves has escalated. Through this experience, I learned how to problem solve to get through a tough situation, communication skills and decision-making skills. This experience is what inspired me to chose my future career path of being a large animal research veterinarian.

Acknowledgements

- Dr. Sierra Gynn, DVM, PhD
VA-MD College of Veterinary Medicine
205 Duck Pond Drive
Blacksburg, VA 24061
- Dr. Cindy Wood, PhD
Virginia Tech
3208 Litton Reaves Hall
Blacksburg, VA 24061
- Natalie Scheuer, BS
VA-MD College of Veterinary Medicine
205 Duck Pond Drive
Blacksburg, VA 24061

Contact information

If you have any questions regarding my capstone project or would like to learn more feel free to contact me at haleyschwarz@vt.edu